Systematic Review

The Factors Associated with Successful Aging in Elderly: A Systematic Review

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ABSTRACT

Introduction: Successful aging (SA) is defined as adding life to years and as feeling satisfied with past and present life. Criteria for successful aging: free of disease and disability; high levels of physical and cognitive functioning; and social engagement. The aim of this study was to describe factors associated with successful aging among older people

Methods: The literature search strategy identified 1.914 articles. The PRISMA strategy was used to identify articles that met inclusion criteria. Initially 255 duplicated studies were excluded; resulting in 1659 articles screened for inclusion in this review. A further 1567 articles were removed based on the title and abstract. The remaining 32 articles were assessed for inclusion this review. Nineteen articles were excluded. In total 13 studies met inclusion criteria for this review. These 13 studies were assessed for quality, data extraction and synthesis.

Results: The factors associated with successful aging are age, gender, few physical morbidities, absence of depression, body weight or BMI in the overweight range, carrying out more than six AADL and high levels of physical activity, education, smoking, alcohol consumption, marital status, proactive engagement, wellness resources, positive spirit, and valued relationships, sleep quality, leisure activity, economic status, religious activity, and high perceived meaningfulness.

Conclusion: The factors that influence successful aging are socio-demographic factor, physiological, psychological, and lifestyle behavioral factors. This study shed light on the key factors that healthcare providers or researchers should consider in intervention studies and programs to promote healthy aging.

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INTRODUCTION

Increasing life expectancy results in a growing number of older people, so that maintaining a good health and function in older people is an important target in aging societies. The universal outcome is for successful aging or healthy aging. This has been a main subject of investigation in recent decades. Successful aging (SA) is defined as adding life to years and as feeling satisfied with past and present life (Eun & Kahana, 2017). Identifying factors that may positively influence successful aging (SA) is of great

interest both for individuals and society, as the proportion of the world's population over 60 years is expected to almost double between 2015 and 2050 (Eun & Kahana, 2017).

Successful aging has been recently investigated, but it is a concept that remains without a consensus definition, even though different factors have been examined, such as avoiding disease and disability, having high cognitive, mental or physical function, being actively engaged in life and psychologically well adapted (Boero, Francesco, Vizzuso, & Dessì, 2017). The domains of physical and functional health,

psychological wellbeing and cognition, social engagement and family support, economic resources and financial security have been included in the definition of successful aging.(Boero et al., 2017) Successful aging shows a low level of disease and/or disease-related disability, relatively high physical and cognitive functioning and active and productive engagement in life activities (Boero et al., 2017).

There are several theoretical models to explain the phenomenon of aging successfully. For example, Rowe and Kahn (1997) interpreted successful aging as "avoidance of disease and disability, maintenance of high physical and cognitive function, and sustained commitment to social and productive activities." The model is in line with the definition of health from the World Health Organization as "a state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity" (Bosnes et al., 2016). From a psychosocial perspective, Baltes and Baltes (1990) proposed the model of selection, optimization and compensation (SOC) that considers the aging process as a dynamic process, that is to say, a number of adjustments made by individuals throughout their life course. Another more recent model is the one by Lee, Lan, and Yen (2011) that includes four successful aging factors: a physical factor, a psychological factor, a social factor and a factor of leisure time. On the other hand, Troutman, Nies, Small, and Bates (2011) have measured successful aging through functional performance, intrapsychic factors, gerotranscendence and spirituality, considering the four dimensions being related to each other. Following Troutman et al. (2011, p. 223), functional performance may be defined as the use of conscious awareness and choice as an adaptive response to cumulative physiological and physical losses related to the aging process. Intrapsychic factors are enduring character features that promote adaptation to change and problem solving. Spirituality could be defined as personal views and behaviors a person has that express his/her relatedness to something greater than oneself. And finally, Gerotranscendence, following the conceptualization by Tornstam, is defined as a shift in perspective in the adult and old age from a materialistic and rationalistic perspective to a more mature and existential one. Therefore, we follow here the theoretical framework of Flood (2002; 2005), who measures successful aging based on a theoretical definition that includes multiple dimensions of successful aging, and does not exclude individuals from being considered successful agers based on physical limitations alone (Gutiérrez, Tomás, & Calatayud, 2018).

Healthy aging depends on genetic, environmental and behavioral factors, as well as socioeconomic determinants. Very important is the point of view of older respondents (Pac et al., 2019). In one review, SA was related to younger age, not smoking, absence of disability, arthritis and diabetes, better self-rated health, absence of depression and cognitive impairment, fewer medical conditions, and more physical activity and social networks. (Hsu, Tsai, Chen, & Wang, 2017). Few relationships to SA were found for demographic factors. Studies using a multidimensional concept of SA have suggested that younger age, a higher level of education, marriage, greater satisfaction with life, higher socioeconomic status, and higher income are related to SA. Regarding gender differences, the results are inconclusive, as both male gender and female gender have been found to be associated with SA. Based on previous research, it is hypothesized that the prevalence of SA, the relative importance of components of SA, and the correlates of SA will change with increasing age (Bosnes et al., 2016).

One of the protective factors for successful aging in older age is resilience; it includes self-efficacy, access to social support network, optimism, perceived economic and social resources, spirituality and religiosity, relational accord, emotional expression and communication, and emotional regulation (Boero et al., 2017). In older people, greater ability to savor positive experiences and higher resilience may predict greater happiness, lower depression, and greater satisfaction with life (greater psychological wellbeing) (Boero et al., 2017). Physical resilience has been recently defined as a characteristic which determines one's ability to resist or recover from functional decline following health stressors and it is highly relevant in successful aging (Boero et al., 2017).

The aim of this systematic review was to assess the risk factors that are associated with successful aging in older people. The goal was not to summarize the whole of the prevalence on risk factors in adult life. Rather, we aimed to identify associations specifically derived from people in life to inform the development of well-targeted interventions that will minimize the impact of ill health in later life.

MATERIALS AND METHODS

Search Strategy

The following review steps were performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines for conducting a systematic review. A systematic search was first conducted using the following databases: Scopus, PubMed, CINAHL/EBSCO, ScienceDirect, Springer Link, and Cambridge using search strategies described in Figure 1. Studies published in the English language from the past five years (January 2015 to January 2020) were included. The search was conducted in December 2019, to ensure that any articles published after the initial search were included. Appropriate medical subject headings (MeSH) were used along with text word searches and phrases. Keywords with Boolean operators that were searched in each database include (risk factors) OR (precipitating factors) OR (protective factors) AND (successful aging) OR (Healthy aging) OR (Positive aging) OR

(robust aging) OR (Optimal aging) OR (productive aging) OR (effective aging) OR (aging well) AND (Elderly) OR (older adults) OR (older people) OR (aged). These phrases were used with both "aging" and "ageing" spelling conventions, put in quotations, and linked via the Boolean operator "OR." Where possible, a wildcat operator, i.e. "*" was inserted as a suffix to capture all permutations of the phrase. Furthermore, where possible, in a given database, non-human studies were excluded. An example of the search input for the phrase "successful aging" in PubMed is as follows: "successful* aging" OR "successful* ageing." This search is processed by PubMed as: successful* aging (All Fields) OR "successful* ageing" (All Fields) AND "humans" (MeSH Terms).

Inclusion and Exclusion Criteria

We included all English language studies that regarded risk factors associated with successful aging in older people published between January 2015 and January 2020. This review includes original research (experimental, non-experimental, observational, and qualitative studies). Systematic review and literature review were excluded. Studies were deemed eligible if they were explicitly targeted at the population aged 60 years and over or those papers specifically targeting the older persons (i.e. explicated in their title or in the aim of their abstract). Research needed to report as outcome measures factors associated with successful aging in older people.

Quality Assessment
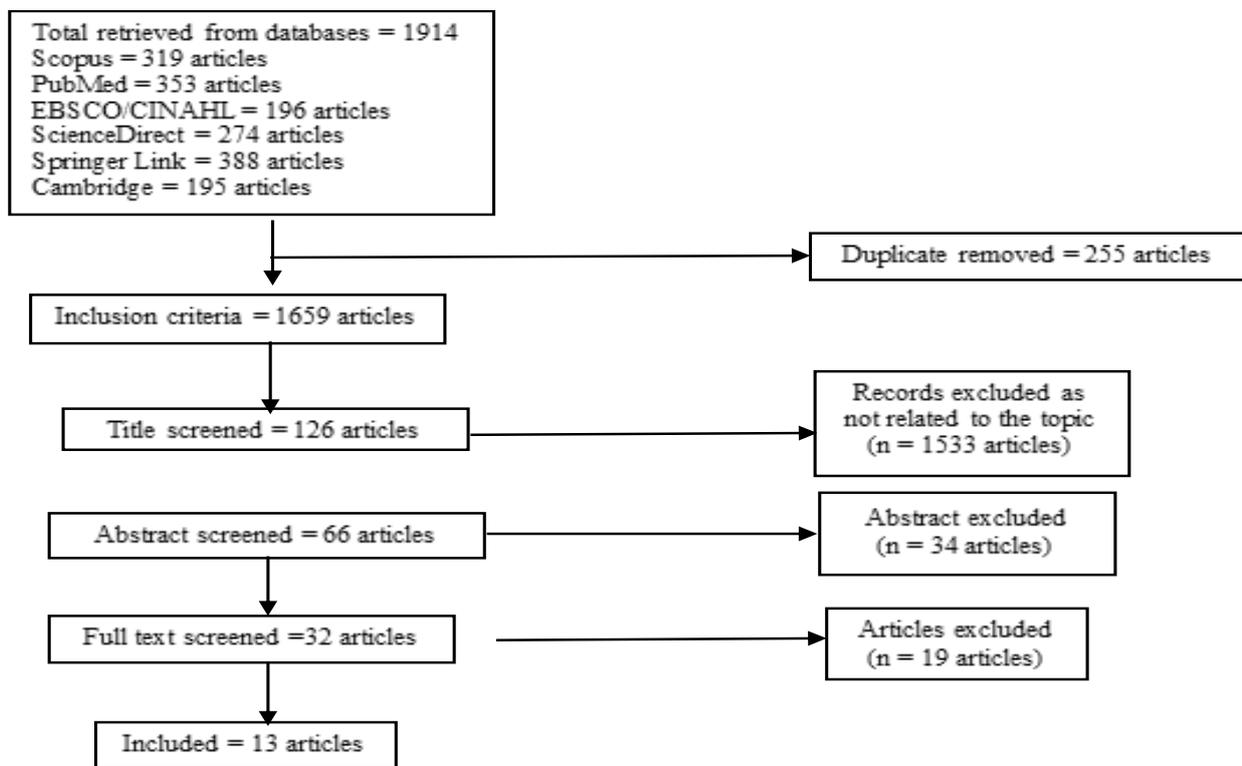
Figure 1. Article selection process

Table 1. Overview of included study

Articles (authors, year)	Country	n	Age baseline	Length of follow up	Quality
Canêdo et al., 2018	Brazil	845	≥ 65 years	1 years	++
Arroyo-quiroz, Brunauer, & Alavez, 2020	Mexico	1.845	63-77 years	14 years	++
Bosnes et al., 2016	Norwegian	5.773	70 – 89 years	2 years	++
Eun & Kahana, 2017	USA	550	≥ 65 years	9 months	+
Shi et al., 2016	China	2.296	≥ 65 years	3 years	++
Foscolou et al., 2018	Mediterranean islands	3.131	≥ 65 years	12 years	+
Hsu, Tsai, Chen, & Wang, 2017	Taiwan	1.977	62 – 69 years	14-18 years	++
Kollia et al., 2018	England	10.906	61-75 years	10 years	++
Liu & Su, 2016	Taiwan	11.145	≥ 60 years	14 years	++
Manasatchakun, et al., 2016	Thailand	453	≥ 60 years	5 period	+
Pac et al., 2019	Poland	4.653	≥ 65 years	1 years	++
Cohen, Talamas, & Sabik, 2019	USA	165.259	≥ 65 years	1 years	+
Tarraf, 2017	USA	7.335	65-101 years	2 years	++

Table 2 Summary of selected study (design, measure, outcome)

Authors, year	Design	Instruments	Outcomes
Canêdo et al., 2018	Cross-sectional	The Minnesota Leisure Physical Activity instrument, self-reported depression, advanced ADL	The prevalence of SA was 25%. The factors associated with SA were age, few physical morbidities, absence of depression, BMI in the overweight range, carrying out more than six AADL and high levels of physical activity.
Arroyo-quiroz, Brunauer, & Alavez, 2020	Cohort	Questionnaire, physical examination	Modifiable life style factors, including physical activity, depression and body weight, are associated with healthy aging. Maternal longevity is related to healthy aging at age 77 which might suggest a genetic determinant. In accordance with studies carried out in Caucasian and Asian populations, our findings suggest that not only genetic, but also behavioral factors have an important influence on healthy aging and longevity.
Bosnes et al., 2016	Cross-sectional	HUNT3 Survey	The prevalence of SA is 14.5. The significant correlates of SA were younger age, female gender, higher education, weekly exercise, more satisfaction with life, non-smoking, and alcohol consumption, whereas marital status was not related to.
Eun & Kahana, 2017	Survey	SAI (successful aging inventory modified version of the Positive and Negative Affective Schedule (PANAS) the CES-D (Centers for Epidemiologic Studies – Depression scale) IADL rating scale measure	The 4-factor solution provided a satisfactory fit to the data: proactive engagement, wellness resources, positive spirit, and valued relationships.
Shi et al., 2016	Survey	Questionnaire, physical examination	The prevalence of SA was 38.81% in the CLHLS in 2012. There were significant differences between age groups, with SA compromising 56.85% among ≥65 years group and 20.31% among ≥100 years group. The prevalence of SA among females was 33.59%, males (45.58%). In the regression analysis, having anemia (OR=0.744, 95% CI: 0.609-0.910), poor lifestyle (OR=0.697, 95% CI: 0.568-0.854), poor sleep quality (OR=0.558, 95% CI: 0.456-0.682), and central obesity (OR=0.684, 95% CI: 0.556-0.841) were the main factors associated with SA. The promoting SA rate decreased as age increased, and the group of 65-79 years had higher odds than the other age group.
Foscolou et al., 2018	Cohort	International Physical Activity Questionnaire (IPAQ), food frequency questionnaire (FFQ), physical examination	A decrease in the prevalence of current smoking ($p < 0.001$), engagement in physical activities ($p=0.001$) and participation in social events ($p=0.001$) for every year increase in age was found. Moderate alcohol drinking increased through aging ($p=0.008$), whereas adherence to Mediterranean diet remained stable, but adequate ($p=0.90$).
Hsu, Tsai, Chen, & Wang, 2017	Cohort	Row and Khan with modification	Higher educational level, conjugal living, absence of smoking or betel quid chewing, moderate alcohol drinking, routine physical activity, more leisure activities, no hypertension, no diabetes, sleeping well and satisfied with economic condition were the positive predictors for becoming a healthy octogenarian.
Kollia et al., 2018	Cohort	ELSA study protocol	Both education and household wealth over time were positively associated with the health metric ($p<0.001$). Lifestyle behaviors (i.e., physical activity, smoking habits and alcohol consumption) mediated the effect of education and household wealth on the health metric and the latter mediated their effect on overall mortality.
Liu & Su, 2016	Cohort	TLSA questionnaire	Age and sex disparities, educational and economic status, health behaviors, and social participation at the individual level were found to be the robust factors in predicting healthy aging.

Quality appraisal of studies was done using a validated quality appraisal checklist from the Centre for Evidence Based Medicine (CEBM). Each full paper was assessed by one reviewer and checked for accuracy by another. The studies were assessed twice and discrepancies resolved by discussion. No studies were excluded on the basis of quality.

Data Collection and Extraction

Data from the eligible studies were extracted using structured sheets containing information on authors/years, type of study, participants/sample,

Authors, year	Design	Instruments	Outcomes
Manasatchakun, et al., 2016	Cross-sectional	Healthy aging instrument (HAI)	Older Persons in North eastern Thailand have 24.30 % of the variance in HAI scores living outside central city, Religious activities may be the source of good emotional support, being married, income level, high perceived meaningfulness were major factor associated with perceived health and healthy aging.
Pac et al., 2019	Cross--sectional	Row Khan Model of Successful Aging	The prevalence of HA appeared as high as 17.6% if none or 1 chronic disease was present and 42.8% if no information about chronic diseases was taken into account. The association between known health predictors (age, marital status, education, income) and HA was observed. Moreover, HA appeared in relation with indicators of physical functioning and lifestyle. There was a strong concordance between HA and the fair self-rated health (OR = 1.87; 1.99, and 2.74 for the 1st, 2nd and 3rd definitions, respectively) and opposite relation with self-reported need for help (OR = 0.15; 0.15.
Cohen, Talamas, & Sabik, 2019	Survey	Behavioral risk factor surveillance system (BRFSS)	Alaska Natives/American Indians were more likely than respondents of other races to be smokers (OR 1.62, 95%CI 1.60–1.63), while in Alaska, the association between race and smoking was not significant (OR 1.00, 95%CI 0.94–1.06).
Tarraf, 2017	Survey	RAND HRS survey module	We find that favorable childhood conditions significantly improve healthy aging scores, both directly and indirectly, mediated through education, income, and wealth. We also find that good health habits have positive effects on healthy aging that are larger in magnitude than the effects of childhood factors. Our findings suggest that exercising, maintaining proper weight, and not smoking are likely to translate into healthier aging.

Table 3. Overview of included study (Factors related with successful aging)

Articles (authors, year)	Factors related with successful aging
Canêdo et al., 2018	Age, few physical morbidities, absence of depression, BMI in the overweight range, carrying out more than six AADL and physical activity
Arroyo-quiroz, Brunauer, & Alavez, 2020	physical activity, depression and body weight
Bosnes et al., 2016	Age, gender, education, exercise, satisfaction with life, non-smoking, and alcohol consumption,
Eun & Kahana, 2017	Proactive engagement, wellness resources, positive spirit, and valued relationships.
Shi et al., 2016	Ages, gender, anemia, poor sleep quality and obesity
Foscolou et al., 2018	Smoking, physical activities and participation in social events, alcohol drinking
Hsu, Tsai, Chen, & Wang, 2017	Higher educational level, conjugal living, absence of smoking or betel quid chewing, moderate alcohol drinking, routine physical activity, more leisure activities, no hypertension, no diabetes, sleeping well and satisfied with economic condition
Kollia et al., 2018	Education and household wealth, Lifestyle behaviors (i.e., physical activity, smoking habits and alcohol consumption)
Liu & Su, 2016	Age and sex disparities, educational and economic status, health behaviors, and social participation
Manasatchakun, et al., 2016	Religious activity, being married, income level, high perceived meaningfulness
Pac et al., 2019	Age, marital status, education, income and lifestyle
Cohen, Talamas, & Sabik, 2019	Smokers
Tarraf, 2017	Childhood conditions, education, income, and wealth. exercising, maintaining proper weight, not smoking

follow-up periods/time, quality of the studies, outcomes measured and main findings. The first author performed data extraction and the second author checked data were extracted.

Data Synthesis

Based on various results, such a different methodological approaches, different findings and a limited number studies for the risk factors of successful aging outcome, it was impossible to conduct meta-analysis of these outcomes. Therefore, the results were presented in narrative form, including tables to clarify. Figure 1 show articles selection process from PRISMA strategy. Total articles retrieved from databases were 1,914 articles, potentially selected for study. There were 255

duplicated articles, thereby resulting in 1,659 articles. These were screened for inclusion with this review. A further 1,533 articles were removed because they were not related with the topic of studies, resulting in 126. The next step selected the 126 articles based on title, resulting in 66 articles and removing 34 articles because the title was not related with the studies. Then, 66 articles were screened with the abstract. resulting in 32 articles and 34 articles removed because the abstract was not related with the studies. The last were selected by reading the full text from 32 articles, which resulted in13 articles and 19 articles excluded for these reasons: participants aged below 60 years, published in others language than English, outcome not about prevalence and risk factors of successful aging. . In total, 13 studies met inclusion criteria for this review and were then assessed for quality, data extraction and synthesis.

RESULTS

This systematic review obtained 13 selected articles originated from Brazil, Mexico, Norwegian, China, Thailand, French, Germany, USA, Taiwan, England, Poland, Spanish and Mediterranean islands. The results of the systematic review and scoring of articles from all 13 articles are attached to the existing Matrix, Table 1. It was found nine journals having good quality, and the four journals having moderate quality. The number of samples varies between 453 - 165,259 respondents. Length of follow-up also varies between nine months and 18 years.

From the results of the review, it showed the factors associated with successful and healthy aging in elderly, as in the following table. Based on Table 2, we know that the design of studies was cross-sectional, cohort and survey. Measuring instruments used in all the studies are observation sheets, questionnaires and assessment sheets. There was found prevalence and the factors associated with successful aging (SA).

The prevalence in several countries are 25% in Brazil, 14.5% in Norwegian, 38.81% in China, 24.30% in Thailand, 17.6% and 42.8% in Poland. The factors associated with successful aging are age, gender, few physical morbidities, absence of depression, body weight or BMI in the overweight range, carrying out more than six AADL and high levels of physical activity, education, smoking, alcohol consumption, marital status, proactive engagement, wellness resources, positive spirit, and valued relationships, sleep quality, leisure activity, economic status, religious activity, high perceived meaningfulness.

DISCUSSION

The aim of this systematic review is to explore multiple factors associated with successful aging (SA) among older people. This review analyzed the roles of socio-demographic factors, physiological factors, psychological factors and lifestyle behavior factors (Canêdo et al., 2018). Socio-demographic characteristics have a strong influence on healthy aging over time. Age, sex, and socioeconomic, education, marital status, religion are significantly and highly associated with individuals' odds of successful aging, with successful aging being defined strictly as "having no major disease, no activity of daily living (ADL) disability, no more than one difficulty with seven measures of physical functioning, good cognitive functioning, and being actively engaged" (as defined by McLaughlin et al. cited in Liu, 2016). The relationship between age and SA has been widely documented: a significantly higher proportion of younger individuals achieve SA versus older individuals. Research showed that, for each additional five years of age, the probability of SA would be lowered by 64%, while another study showed that longevity was the third element of successful aging (Shi et al., 2016). Successful aging was more prevalent among males, because they had more social resources and relatively higher income. In addition, men tend to live fewer years than women. Our study finds this same gender difference, with men having an advantage in SA (Shi et al., 2016).

Another socio-demographic factor associated with perceived health and healthy aging was being married. One might argue that married persons' support from their spouse or children is connected to positive effects on individual health (Manasatchakun, Chotiga, Hochwälder, & Roxberg, 2016). Being married might confer health advantages that influence perceived health. These could be, e.g., emotional support, instrumental support, and social exchange with the partner (Manasatchakun et al., 2016). However, we also found that older people who were divorced or widowed reported higher HAI scores than those who were unmarried, possibly because they receive emotional support from their children (Manasatchakun et al., 2016). The children are expected to be the primary sources of support for older persons. They can help older people with personal management, physical care, economic, and emotional support. Based on the present findings, one suggestion is that healthcare providers or policy makers should target unmarried and childless older people to promote healthy aging. Another suggestion is, therefore, that neighbors or friends of older people should be involved in promoting healthy aging among older people who are single and among those who live alone (Manasatchakun et al., 2016).

From physiological variables, we found a directly proportional association with the number of physical morbidities. Those who reported the absence of or less than two morbidities showed a higher probability of SA. Evidence suggests that the functional consequences of chronic diseases are not inevitable, and can be significantly and positively influenced by several potentially modifiable factors, such as physical activity, social support, self-efficacy and psychological profile (Canêdo et al., 2018). Regarding BMI, overweight was positively associated with SA in relation to obesity. There are few studies evaluating the relationship between BMI and Successful aging in elderly, despite the association of overweight with a

discrete increase in incapacities among older adults when compared with the normal weight group (Canêdo et al., 2018). Income and education have positive relationship with SA. Higher income and education have high impact on SA. Education and financial status over time were both proved as strong and independent predictors of healthy aging (Kollia et al., 2018). Older people with a source of income might, in turn, feel financially independent and have access to quality resources and health services. A few participants continued to work after retirement, and a few continued to receive minimal salaries after retirement. Therefore, it was difficult for them to access the services that they wanted on a limited income (Manasatchakun et al., 2016). High level of education makes older people have more knowledge about health and how to maintain healthy aging.

Lifestyle behavioral factors were smoking, alcohol consumption, and physical activity. Respondents who had never smoked were also more likely to be SA compared to current smokers, a finding in accordance with previous studies. Less than weekly consumption of alcohol was also positively related to SA, compared to no consumption last year and weekly consumption (Bosnes et al., 2016). Smoking has been widely reported to be harmful and responsible for several chronic diseases. People who had smoked >20 packs/year were observed to be more likely to be frail than those who had never smoked. Whether drinking contributes to good health is somewhat controversial (Hsu et al., 2017); however, no alcohol consumption has good significance with SA achievement. Physical activity has been suggested to have a long-term effect on people's perception of health and be an essential element of successful aging. The level of physical activity at age 65 years was reported to predict successful aging seven years later in the PROOF (PROgnostic indicator OF cardiovascular and cerebrovascular events). Physically active people are more likely to have a healthier lifestyle, avoiding smoking or excessive drinking. Furthermore, sedentary behavior and physical activity have both been identified as independent predictors of healthy aging. Higher level of leisure activity was associated with a lower risk of cognitive decline, whereas cognitive decline was associated with inactive leisure activity, but not with physical activity or social activity. Recent studies also support the findings of Li et al. who reported that sleeping 7–8h daily was a predictor of good health in older Chinese (Hsu et al., 2017). Because poor sleep quality can cause psychological stress, illness or neuropsychological problems, difficulty in initiating or maintaining sleep could be associated with depression. Between psychosocial variables, being engaged in multiple social or productive activities was positively associated with SA. Several studies have shown that a high level of participation in productive and social activities has both subjective impacts related to life satisfaction and objective effects on functional and cognitive status, physical health, and mortality. In addition, we found a positive association between SA and the absence of depression. Evidence has shown that even mild and sub-syndromic depression is associated with declining overall functioning and disability. Regular social participation was found in this research to be a robust factor in terms of protecting a person from deteriorations in health. That means that the healthy behaviors and social relationships appear to be influential factors of health status, which might compensate for personal factors, such as marital status.

We identified the factors of healthy aging based on a multidimensional definition. The present findings have added evidence to the associations of those frequently identified factors and some specific factors with the probability of healthy aging. These findings should be useful for designing health promotion strategies to increase the likelihood of achieving aging with good health for older adults (Hsu et al., 2017). Healthy lifestyle promotion could focus on changes earlier in the life of an elderly individual. The old people should not only use the existing healthcare services to maintain their health, but also try their best to maintain a balanced diet, participate in sufficient physical activity, adequate sleep and eliminate bad habits, so as to increase the positive factors in SA.

CONCLUSION

The promotion of health and maintenance of a sense of wellbeing among older adults are vitally important aims for policy makers and healthcare providers because the older population is increasing dramatically. The factors that influence successful aging are socio-demographic, physiological, psychological, and lifestyle behavioral factors. This study shed light on the key factors that healthcare providers or researchers should consider in intervention studies and programs to promote healthy aging.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ACKNOWLEDGEMENT

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